Dairy Research

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Agreement between 24 and 48 hour aerobic culture results when diagnosing mastitis pathogens.

Using 24 versus 48 hour aerobic culture results for mastitis treatment

Clinical mastitis is the main reason dairy cows are administered antibiotics. However, the decision to treat or not to treat, when to start treatment, and which antibiotic therapy to use can be challenging, even when culture results are incorporated in the decision making process.

Pathogen based decision making regarding which cows to treat and which medication to use for treatment will help achieve prudent use of antibiotics in the dairy industry. Doing this is necessary to preserve the public's trust in the quality and safety of dairy products. It may also perhaps reduce the risk of antimicrobial resistance.

Culture based decision making is profitable for individual dairies because they are able to save money on intramammary (IMM) antibiotics and labor, as well as have less discarded milk while cows are waiting for the withholding times to expire.

Approximately 25 to 35% of clinical mastitis cases have no bacteria that can be grown with conventional culture techniques and do not likely have bacteria that are responsive to available antibiotics.

Recent research suggests treatment outcomes are similar even when IMM antibiotic treatment is delayed 24 hours (and up to 48 hours) in non-systemically ill cows with clinical mastitis. This additional time saving can be helpful because it gives the producer the opportunity to make the right decision based on the identification of the pathogen causing mastitis and aids in the reduction of overtreatment.

Overtreatment refers to treatment of cows with pathogens that will not respond to medication, for example *Prototheca*, yeast or negative cultures. This can be costly due to the cost of treatment/labor and the milk discarded to avoid violative residues. However, even with the data available at 24 hours, there has been some concern over the accuracy of 24 hour results, versus the 48 hour gold standard.

A review of over 1,500 mastitis events from farms that submitted clinical samples to the Quality Milk Production Services (QMPS) laboratory between January and March of 2014 revealed that making treatment decisions based on the 24 hour culture data is an OK choice. Pathogens were categorized by treatment decisions as presented in Table 1.

When the data from the two days were compared, they were almost in complete agreement, Kappa = 0.93. This is a measure of agreement beyond what would occur by chance alone; 0.93 is very high.

However, the more important question is: when where they not in complete agreement and was the wrong treatment or culling decision made? Figure 1 is a graphical representation of the changes seen between 24 hour and 48 hour results. There was a decrease in category 1 (no growth) and small increases in all other categories. The most frequent change was from no growth to category 2 (gram positive). This is expected because some pathogens take longer to grow.

Did this negatively affect the treatment decision?

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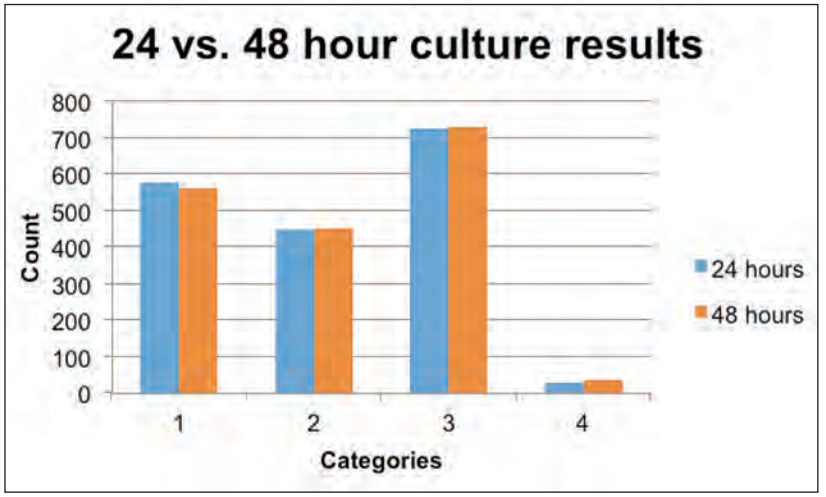

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that had a wide range of *DeNovo* FA (g/100 g fat) were selected for a more in-depth field study. This study began in April 2014 to determine if there are cost effective feeding and management practices that can be used to increase fat and protein tests based on monitoring milk FA composition.

During the 14 month period of our study, the 10 Holstein and 10 Jersey low *DeNovo* herds averaged 3.62 and 3.97% fat and 2.99 and 3.15% true protein, while the 10 high *DeNovo* Holstein and Jersey herds averaged 3.92 and 4.80% fat and 3.09 and 3.62% true protein, respectively.

Going forward, this work is leading to individual cow testing directly on large farms by mid-FTIR within the US to provide real-time farm management data. Our vision for the future is the core of the instrument being integrated directly into the milking system. This instrument would collect data on every cow, every milking and transmit data immediately to a central data processing system, with the return message to the farm on individual cows identifed, status and possible managment actions to be taken.

Some measures we have developed that may be useful for individual cow milk testing are blood BHB and blood nonesterfied fatty acids (NEFA) for ketosis prediction. We have also developed models to measure milk trans fatty acids that may be used to predict classical milk fat depression. Our primary focus is to have measures that are predictive to provide advance warning of coming nutritional or health problems before they become severe. Combinations of individual parameters that provide more predictive indices of feed efficicency, rumen pH, ketosis and probability of successful breeding may be derived from the current PLS models for milk analysis.

In the future, our development of PLS models to determine pregnancy status and loss of pregnancy will bring further benefit in the applications of mid-IR milk testing for real-time farm management milk testing. ❒

Using 24 versus 48 hour aerobic culture results for mastitis treatment

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Did this negatively affect the treatment decision? If producers used the 24 hour data, would they have made the wrong choice on that cow? The answer is probably not. If the test stated no growth, or no important growth at 24 hours, and the cow was not systemically ill, she did not receive any treatment. However, if at 48 hours the test showed a gram positive organism that required treatment. This delayed treatment did not affect many cases (39/578 in this study).

Table 1. Categories, description and possible treatment choice

Category	Description	Possible treatment choice
1	No growth, no important growth	No treatment
2	Gram negative	No intramammary treatment, +/- systemic treatment
3	Gram positive	Treatment depends on the pathogen Likely need more information: Streptococcus spp. vs. Staphylococcus spp; Streptococcus identification to species level when possible, and rule out Staphylococcus aureus if Staphylococcus spp.
4	Yeast, Prototheca, mold, etc.	No treatment, +/- cull, dry off quarter

What about *Staphalycoccus aureus*? We don't want to misclassify a cow with a contagious pathogen at 24 hours and have it change at 48 hours! In this study, at the QMPS lab, there were no such instances. Zero cases were labeled as *Staphalycoccus aureus* at 24 hours and then changed at 48 hours. However, most cases (56/85) were identified as *Staphalycoccus aureus* at 48 hours.

What about gram negative organisms? Of the 462 gram negative organisms identified, most (438) were identified as gram negative within 24 hours and when possible more information was provided (e.g., *Klebsiella*) at 48 hours.

What about category 4, "other"? Category 4 includes: yeast, mold, *Nocardia*, *Prototheca*, and fungus. There were very few cases. On day one there were 28 out 1,779 cultures, however, one changed from category 4 on day one to category 2 on day two.

What does this mean to the average producer? If you work with a certified lab, the results of this study should be comparable. However it never hurts to ask. A certified lab should undergo proficiency testing and quality assurance on a regular basis. If you evaluate milk cultures on your own farm, it is easy to compare the results at 24 hours versus 48 hours and evaluate whether your treatment decision would change. However, you first have to know if you're doing the right thing. Please consider proficiency testing and quality assurance for your lab on a regular basis. The ability to use the information at 24 hours to make prudent antibiotic treatment decisions with accurate information can save you time and money. ❒